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(54) CALENDERABLE ABS RESIN COMPOSITION

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CLAIMS

1. Calenderable ABS resin composition, consisting of 100 parts by weight of ABS resin, 0.1-4 parts by weight of a metal soap, and 0.05-3 parts by weight of a fatty acid ester.

2. Calenderable ABS resin composition, consisting of 100 parts by weight of heat-resistant ABS resin, 0.1-4 parts by weight of a metal soap, 0.05-3 parts by weight of a fatty acid

ester, and 0.05-5 parts by weight of a plasticizer having an average molecular weight above 1000.

3. The calenderable ABS resin composition described in Claim 1 or 2, with a high-molecular-weight compound having antistatic properties being blended with the ABS resin.

4. The calenderable ABS resin composition described in Claim 1 or 2, with the metal soap being a stearic acid or lauric acid salt of barium, calcium, zinc, magnesium, lead, or cadmium.

5. The calenderable ABS resin composition described in Claim 1 or 2, with the fatty acid ester being a fatty acid ester with a lower alcohol, fatty acid ester with polyhydroxy alcohol, or fatty acid ester with a polyglycol.

6. The calenderable ABS resin composition described in Claim 2, with the plasticizer having an average molecular weight above 1000 being epoxidized soybean oil, adipic acid polyester, or phthalic acid polyester.

DETAILED EXPLANATION OF THE INVENTION

INDUSTRIAL APPLICATION FIELD

The present invention concerns calenderable ABS resin compositions.

CONVENTIONAL TECHNOLOGY

In general, ABS resins have excellent mechanical properties, electrical properties, and chemical resistance, and have been used in various applications. In particular, sheet products have been produced by extrusion molding and injection molding processes. However, the ABS resin itself is poor with regard to peeling from the surface of a hot roll, i.e., roll peeling, thus processing ABS resins by calendering is difficult.

PROBLEMS TO BE SOLVED BY THE INVENTION

However, since sheet molding by calendering is the most productive method, ABS resin compositions having a good calender moldability without adverse effects on the ABS resin properties are highly desired.

Also, in general, ABS resins have problems with respect to their thermal properties (heat resistance and thermal deformation resistance) when used at a temperature above 100-110°C; the development of heat-resistant grades that can withstand a temperature above 100°C has actively been pursued in recent years. Also, for such heat-resistant ABS resins, ABS resin compositions having good moldability for calendering into sheet moldings are strongly desired.

Also, recently, ABS resins obtained by blending ABS resins with high-molecular-weight compounds having permanent antistatic properties have been developed. Even for such antistatic ABS resins, ABS resin compositions having good moldability for calendering into sheet moldings are strongly desired.

The present invention is to meet such demands, and it is an objective of the present invention to provide ABS resin compositions that can be inexpensively calendered into sheet moldings with good roll peeling to form a smooth surface free of surface roughness (roughing) and no so-called flow mark formation with a poor appearance, yet with no changes in the properties of the ABS resin itself.

MEANS FOR SOLVING THE PROBLEMS

The present invention is to achieve the objectives described above. The first part of the present invention concerns calenderable ABS resin compositions consisting of 100 parts by weight of ABS resin, 0.1-4 parts by weight of a metal soap, and 0.05-3 parts by weight of a fatty acid ester.

The second part of the present invention concerns calenderable ABS resin compositions consisting of 100 parts by weight of heat-resistant ABS resin, 0.1-4 parts by weight of a metal soap, 0.05-3 parts by weight of a fatty acid ester, and 0.05-5 parts by weight of a plasticizer having an average molecular weight above 1000.

The ABS resin in the calenderable ABS resin compositions in the first and second inventions may be blended with a desired amount of high-molecular-weight compounds having antistatic properties.

The metal soaps described above may be one, two, or more of stearic and lauric acid salts of barium, calcium, zinc, magnesium, lead, or cadmium.

The amount of metal soaps added to 100 parts by weight of the ABS resin is 0.1-4 parts by weight, preferably 0.5-3 parts by weight.

With the amount of the metal soap added being below 0.1 part by weight, the roll peeling of the resin composition is poor, and the resin compositions stick to the hot roll, making sheet molding impossible. On the other hand, with the amount of the metal soap added being above 4 parts by weight, the sheet surface becomes rough with a poor appearance of the sheets and the cost of the materials is too high.

The fatty acid esters that can be used are fatty acid esters with lower alcohols, fatty acid esters with polyhydroxy alcohols or fatty acid esters with polyglycols. The fatty acid esters with lower alcohols are specifically butyl stearate, etc. The fatty acid esters with polyhydroxy alcohols are specifically hardened castor oil, etc. The fatty acid esters with polyglycols are specifically ethylene glycol monostearate, etc.

The amount of such fatty acid esters added to 100 parts by weight of the ABS resin should be 0.05-3 parts by weight, preferably 0.5-2 parts by weight.

Here, with the amount of the fatty acid esters added being less than 0.05 part by weight, similarly as with metal soaps, the roll peeling of the resin composition is poor, and the resin compositions stick to the hot roll, making sheet molding impossible. On the other hand, with the amount of the fatty acid esters added being above 3 parts by weight, the sheet surface becomes rough, with a poor appearance of the sheets, and the cost of the materials is too high.

The plasticizer having an average molecular weight above 1000 in the second invention described above may be epoxidized soybean oil, adipic acid polyester, phthalic acid polyester, etc. Selecting plasticizers having good compatibility with the resins is needed, and all of the plasticizers illustrated above have good compatibility with ABS resins. The amount of the plasticizers added to 100 parts by weight of the resins should be 0.05-5 parts by weight, preferably 0.5-3 parts by weight.

Here, with the amount of the plasticizers added being below 0.05 part by weight, the sheet appearance becomes poor and the sheets made from the resin compositions become tacky, thus roll peeling is poor and molding into sheets becomes impossible. On the other hand, with the amount of the plasticizers added being above 5 parts by weight, the sheets have a poor appearance and the cost of the materials is too high.

The plasticizers are limited to those with an average molecular weight above 1000 because within this range, bleeding and whitening of the sheet molding surface do not occur.

The high-molecular-weight compounds having antistatic properties that can be blended with ABS resins in the calenderable ABS resin compositions of the first and second inventions are, e.g., the polyether-ester-amides disclosed in Japanese Kokai Patent No. Sho 62[1987]-265340.

Such high-molecular-weight compounds having antistatic properties may be polyether-ester-amides consisting of (a) salts of dicarboxylic acids with aminocarboxylic acids, lactams of 6 or more carbon atoms, or diamines of 6 or more carbon atoms and (b) a poly(alkylene oxide) carboxylic acid with a number-average molecular weight of 200-6000 with a polyether ester unit content of 95-10 wt%, showing sustained antistatic properties.

The usual anionic antistatic agents and cationic antistatic agents used as antistatic agents for plastics have relatively small molecular weights, thus when they are added to ABS resins, the

antistatic agents bleed to the sheet surface during sheet molding and the antistatic properties disappear soon, thus they are not favored.

APPLICATION EXAMPLES

Next, application examples of the present invention are explained.

APPLICATION EXAMPLE 1

To 100 parts by weight of a commercially available ABS resin (heat distortion temperature of 81°C), 0.3 part by weight of barium stearate and 0.5 part by weight of calcium stearate used as metal soaps were compounded with 0.5 part by weight of ethylene glycol monostearate, then the compound was mixed uniformly with a Henschel mixer to obtain an ABS resin composition. Using a reverse L type of 4-roll calender machine, this resin composition was molded at a roll temperature of 200°C into a sheet with a 0.5 mm thickness and 500 mm width.

As a result, a smooth sheet with a good appearance was obtained with a very good roll peeling of the ABS resin composition and no surface roughness.

APPLICATION EXAMPLE 2

To 100 parts by weight of a commercially available heat-resistant ABS resin (heat distortion temperature of 113°C), 0.3 part by weight of barium stearate and 0.5 part by weight of calcium stearate used as metal soaps were compounded with 0.5 part by weight of ethylene glycol monostearate and 1 part by weight of epoxidized soybean oil (tradename: Adekacizer O-130, product of Adeka-Argus Kagaku Co.), then the compound was mixed uniformly with a Henschel mixer to obtain an ABS resin composition. Using a reverse L type of 4-roll calender machine, this resin composition was molded at a roll temperature of 210°C into a sheet with a 0.5 mm thickness and 500 mm width.

As a result, a smooth heat-resistant ABS sheet with a good appearance was obtained with very good roll peeling of the ABS resin composition and no surface roughness.

In the absence of the epoxidized soybean oil, a sheet could be molded, but the surface was rough with a very poor appearance.

APPLICATION EXAMPLE 3

To 100 parts by weight of a commercially available antistatic ABS resin (heat distortion temperature of 90°C) blended with a high-molecular-weight compound having antistatic properties such as the polyether-ester-amide described above, 0.3 part by weight of barium stearate and 0.6 part by weight of calcium stearate were compounded as the metal soaps along with 0.8 part by weight of ethylene glycol monostearate and 1 part by weight of epoxidized

soybean oil (tradename: Adekacizer O-130, product of Adeka-Argus Kagaku Co.), then the compound was uniformly mixed with a Henschel mixer to obtain an ABS resin composition. Similarly as in Application Example 2, using a reverse L type of 4-roll calender machine, this resin composition was molded at a roll temperature of 210°C into a sheet with a 0.5 mm thickness and 500 mm width.

As a result, a smooth permanently antistatic ABS sheet with a good appearance was obtained with a very good roll peeling of the ABS resin composition and no surface roughness.

Measurement of the antistatic properties of the sheet showed very a short half-life of the static voltage and the antistatic property could be sustained for a long time. Furthermore, with regard to the permanent antistatic properties, the sheet showed no difference in antistatic properties between the front (glossy side in contact with the final roll) and the back side.

The mechanical strength such as tensile strength, Izod impact strength, elongation, etc., thermal deformation temperature (thermal property), surface resistivity (electrical property), and chemical resistance measured for the ABS resin compositions obtained in Application Examples 1-3 showed no big changes in the properties of the ABS resins themselves.

EFFECTS OF THE INVENTION

As described above, the calenderable ABS resin composition of the first part of the present invention consists of 100 parts by weight of ABS resin, 0.1-4 parts by weight of a metal soap, and 0.05-3 parts by weight of a fatty acid ester, shows good roll peeling during calendering for sheet molding, forms a smooth surface without surface roughness (roughing) and without a poor appearance such as flow marks, etc., and is effective for the economic production of sheets by calendering.

The calenderable ABS resin composition of the second part of the present invention consists of 100 parts by weight of heat-resistant ABS resin, 0.1-4 parts by weight of a metal soap, 0.05-3 parts by weight of a fatty acid ester, and 0.05-5 parts by weight of a plasticizer having an average molecular weight above 1000 and gives sheets of a heat-resistant-grade ABS resin composition with excellent surface smoothness and appearance, and is effective for the economic production of sheets by calendering.

When a certain amount of a high-molecular-weight compound having antistatic properties is added to the ABS resins in the calenderable ABS resin compositions of the first and second parts of the present invention, permanently antistatic ABS resin composition sheets can be economically produced by calendaring, with no difference in antistatic properties between the front and back.

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